

REMARKS

Applicants request favorable reconsideration and allowance of the subject application in view of the preceding amendments and the following remarks.

Claims 15 and 16 are presented for consideration. Each of claims 15 and 16 is independent, and each has been amended to clarify features of the subject invention. Support for these changes can be found in the original application, as filed. For example, the Examiner's attention is directed to the discussion on page 43 of the original disclosure. Accordingly, no new matter has been added.

Applicants request favorable reconsideration and withdrawal of the rejections set forth in the Office Action dated February 20, 2009.

Claims 15 and 16 were rejected under 35 U.S.C. § 102(b) as being anticipated by the Alkaisi article. Applicants submit that the cited art does not teach or suggest many features of the present invention, as previously recited in these claims. Therefore, this rejection is respectfully traversed. Nevertheless, Applicants submit that independent claims 15 and 16, for example, as presented, amplify the distinctions between the present invention and the cited art.

In one aspect of the present invention, independent claim 15 recites a method of designing an exposure mask with a light blocking member for exposing an image forming layer provided on a substrate to near field light leaking from adjoining openings formed in the light blocking member. The method includes determining a width D of the openings and an opening interval of the openings to be formed in the light blocking member, in which a relation $D \leq (P - W - 2T)$ is satisfied, where T is the height of a pattern to be produced by exposure and development using the image forming layer, W is the linewidth of the pattern and P is the pitch of the pattern,

so that an electrical field distribution, adjacent to the openings of the light blocking member as exposure light is projected on the light blocking member, is approximated to an electrical field model extending circularly concentric with an edge of the light blocking member at an image forming layer side as a center.

In another aspect of the present invention, independent claim 16 recites an exposure method of manufacturing an exposure mask with a light blocking member for exposing an image forming layer provided on a substrate to near field light leaking from adjoining openings formed in the blocking member. The method includes determining a width D of the openings and an opening interval of the openings to be formed in the light blocking member, and processing the light blocking member so as to obtain the width D and the opening interval, in which a relation $D \leq (P - W - 2T)$ is satisfied, where T is the height of a pattern to be produced by exposure and development using the image forming layer, W is the linewidth of the pattern and P is the pitch of the pattern, so that an electrical field distribution, adjacent to the openings of the light blocking member as exposure light is projected on the light blocking member, is approximated to an electrical field model extending circularly concentric with an edge of the light blocking member at an image forming layer side as a center.

Applicants submit that the cited art does not teach or suggest such features of the present invention, as recited in the independent claims.

The Examiner considers the Alkaisi article to teach an exposure mask and a method of making a mask for forming an image on a photoresist on a substrate. A mask with opaque regions is used in an exposure method, using UV illumination, from a source, such as a laser, utilizing near-field diffraction effects to create an image in a photoresist coated substrate beyond a diffraction limit of the projection lithographic system. The Examiner further considers the

exposure mask to include opaque regions with gratings, such as dense or isolated lines. The Examiner further considers the Alkaisi article to teach a simulation and model of the mask based on the pitch and thickness of the medium to be imaged, in order to simulate and model the diffraction in the evanescent near field of the metallic gratings.


Still further, the Examiner takes the position that the Alkaisi article discusses satisfying the relation $D \leq (P-W-2T)$, and that FIG. 11 of that article shows contour plots. Applicants submit, however, that the Alkaisi article teaches nothing about approximating an electrical field distribution based on a concentric circle model about an edge of a light blocking layer, in the manner of Applicants' present invention, as recited in independent claims 15 and 16. In this regard, FIG. 11a of the Alkaisi article provides no suggestion or teaching with respect to a relationship of a distribution of an electrical field and concentric circles. In this regard, the inventors of the subject invention have first discovered the concentric circle model of the subject application as a result of investigations made with regard to the effective design method of an exposure mask. Applicants submit that the Alkaisi article teaches nothing regarding the concentric circles or the concentric circle model in the manner of Applicants' present invention, as recited in independent claims 15 and 16. For the reasons noted above, Applicants submit that the Alkaisi article does not teach or suggest many features of Applicants' present invention, as recited in independent claims 15 and 16. Applicants submit, therefore, that the Alkaisi article should not be read to anticipate or render obvious Applicants' present invention, as recited in independent claims 15 and 16.

For the foregoing reasons, Applicants submit that the present invention, as recited in independent claims 15 and 16, is patentably defined over the cited art.

Applicants submit that the instant application is in condition for allowance. Applicants request favorable reconsideration, withdrawal of the rejection set forth in the above-noted Office Action and an early Notice of Allowance.

Applicants' undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should be directed to our address listed below.

Respectfully submitted,



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